PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

A new or improved method of Mounting a Wheel or the like on a Shaft

We, FISHER & LUDLOW LIMITED, a British Company, of 5, Bean Road, Tipton, in the County of Stafford, do hereby declare this invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a new or improved method of mounting on a shaft a wheel, disc and like member, herein referred to and included in the term wheel, and of the kind comprising a central boss and an integral web portion of axial thickness at a position adjacent the boss, which is less than the axial thickness of the boss itself.

For convenience in description the expression "disc and like member" is herein deemed to be included within the general expression "wheel".

At present, wheels of the foregoing kind are commonly secured to shafts by means of a key or a diametrically extending pin engaging respectively in a keyway of the boss and shaft, or passing through a hole again formed in the boss and shaft.

As a less expensive alternative, the bore of the wheel boss may be so formed in relation to the shaft diameter as to permit of the wheel being driven axially on to the shaft, so as to be a force fit thereon. This last method of assembling is subject to the disadvantage that the positioning of the wheel impairs any bearing surface or other fine finish previously provided on that part of the shaft over which the boss is forcibly driven.

In a still further alternative, the shaft may be formed locally to non-circular section and the wheel boss may be correspondingly shaped, but this latter alternative is usually more expensive in manufacturing cost than the key or pin method of connection more customarily adopted.

The present invention has for its object the provision of a new or improved method of mounting the wheel on the shaft, which avoids the disadvantage of the force fit method of assembly above referred to and is at the same time less expensive in manufacturing costs than each of the other existing methods of assembly above described.

The invention in its broadest aspect, comprises a method of mounting on a shaft, a wheel of the kind specified, and wherein the bore of the wheel boss is such in relation to the shaft diameter as to permit of the wheel being slidden freely along the shaft to the desired position thereon, said method comprising sliding the wheel along the shaft to said desired position thereon, applying to opposite ends of the wheel at a position at the boss or adjacent the outer periphery of the boss, axially directed pressure so as locally to reduce the overall axial thickness of the wheel and cause a displacement of the material in the wheel boss, such as to increase the radial thickness of the boss and decrease the diameter of the boss bore to an extent such as to bring the bore into gripping non-relatively rotatable engagement with the adjacent part of the shaft.

The axially directed pressure may be applied at the boss itself, namely, to the end faces of the boss, so as to decrease the axial thickness of the boss and thereby increase the radial thickness with consequent reduction in the bore of the boss.

However, according to a preferred embodiment of the invention, the web at a position adjacent to the periphery of the boss, is formed on each of its faces with opposed oppositely axially extending projections which

are subjected to opposed axially directed pressures, applied at positions spaced radially outwardly in relation to the boss, so that the material in the projections subjected to said pressure, is displaced into the boss itself to effect an increase in radial thickness of the boss, and a consequent decrease in the diameter of the boss bore, thereby bringing the boss into gripping rotatable engagement with the shaft.

Each of said web projections at the root thereof, may merge into the adjacent outer periphery of the boss, but in order to permit of the pressure being applied by suitable press tools to the projections, they are preferably spaced by a small distance which may be the same or less than the thickness of the web, from the adjacent outer periphery of the boss.

The projections may be of "D" form in cross section, but preferably the projections are of such triangular form, for example, equilateral form in cross section, as to taper equally on their radially inner and radially outer faces.

Preferably the projections each take the form of an annular rib extending continuously around the web concentric with the centre of the wheel.

The wheel may, if desired, be provided with a rim which may be formed with teeth, as applied to spur or sprocket wheels, to which the invention is considered to be especially applicable.

The invention is illustrated in the accompanying drawings wherein:—

Figure 1 is an end view of one form of wheel prior to its mounting on a shaft in accordance with this invention.

Figure 2 is a cross sectional side view of the wheel depicted in Figure 1, showing the press tools in position just prior to applying axial pressure to the wheel boss.

Figure 3 is a view similar to Figure 2, but showing the wheel secured to the shaft, with the press tools having just completed their wheel securing operation.

Figures 4 and 5 are cross sectional views, depicting two stages of a further arrangement for securing a wheel to a shaft in accordance with this invention.

Figure 6 is a cross sectional side view of an alternative form of wheel prior to its securing to the shaft.

Referring firstly to Figures 1 to 3, the invention is depicted as applied to the mounting on a circular shaft 10 of a steel or other metal sprocket wheel 11. This wheel may, for example, have an outside diameter of approximately 2" and is formed with a peripheral rim 12 with a central boss 13, each having an overall axial thickness of approximately 3/8".

The boss 13 may, for example, have a bore 14 of the order of three thousandths of an inch greater than the diameter of the shaft 10, for example, a bore of the foregoing value in excess of 3/4" for mounting on a shaft of 3/4" diameter. In Figure 2 the foregoing difference is exaggerated for clarity.

The web 15 of the wheel may have an axial thickness of the order of 1/8" and both the rim 12 and the boss 13 may have a maximum radial thickness of about 1/8", with the radially outer face 16 of the boss tapering from the web 15 at an angle of approximately 15°, so as to be of radial thickness less than the above value of 1/8", adjacent each end face 17 of the boss 13.

The web 15 at a position adjacent the outer periphery of the boss 13, is formed on each of its faces with opposed axially directed annular rib-like projections 18, each of equilateral triangular form in cross section, having a rood radial width of rather less than 1/8" and with the root of each projection nearest to the boss spaced therefrom by a distance of the order of 1/32".

The overall axial thickness of the web as measured through the apices of the two opposed projections, may be of the order of 5/16".

Such a wheel 11 was assembled on the shaft 10 of the diameter above referred to by sliding the wheel freely along the shaft to the desired position thereon. The two annular projections 18 were then subjected to pressure by engaging them between a pair of annular press tools 19, having plane pressure applying faces 20 extending perpendicular to the axis of the shaft 10 so as to thereby compress the material of the projections into the adjacent web portion 15 and thereby displace material along the web in both a radially inward and also a radially outward direction, so as necessarily to effect an increase in the radial thickness of the boss 13 and thus displace metal of the boss in an inward direction into close non-relatively rotatable engagement with the shaft 10 to secure the wheel 11 thereto.

In such a method of mounting the wheel, it is thought that the squeezing towards one another of the two projections 18 so as to force the material thereof into the web, effectively serves to resist the radially outward reaction of the shaft 10 on the tightly gripping encircling boss 13, so as effectively to maintain the material of the boss in the desired gripping engagement with the shaft.

Necessarily some of the material which is displaced out of the projections 18 into the web 15 will result in some of the material in the web being displaced in a radially outward direction and in the particular specific example above quoted, an increase in the overall diameter of the wheel from 2" to 2-1/16" was noted.

Nevertheless as above indicated, the metal of the boss 13 is brought into non-relatively rotatable gripping engagement with the shaft

10 and a torque transmission test indicated that the connection between the wheel of the shaft was capable, despite the small size of the wheel, of transmitting at least 450 inch lbs. torque without slip.

In order to facilitate the radially inward contraction of the boss, the bore thereof may as shown particularly in Figure 1, be formed with a number, for example, three or as shown six, symmetrically spaced axially extending shallow grooves 21.

Instead of applying axially directed pressure by the press tools 19 to the web 15 at a position adjacent the outer periphery of the boss, as shown in Figures 4 and 5, the axially directed pressure may be applied by the press tools 19 at the boss itself, namely, the two end faces of the boss 13 adjacent its outer periphery. In Figure 4, the tools are shown in the position in which they are just commencing to apply pressure to the end face 17 of the boss and in Figure 5 the parts including the tools 19 are depicted in the position at which the tools have completed operation, so as to deform the boss itself adjacent its outer periphery and displace the metal in the boss to increase the radial thickness of the boss and decrease the diameter of the boss bore to secure the wheel to the shaft.

In this last described arrangement, the web 15 is unprovided with the annular projections 18, the web being of uniform thickness between the boss 13 and the rim 12.

If desired with either of the above described arrangements, as shown in Figure 6, the wheel 11 need not be provided with a peripheral rim 12.

WHAT WE CLAIM IS:—

1. A method of mounting on a shaft, a wheel of the kind specified, and wherein the bore of the wheel boss is such in relation to the shaft diameter as to permit of the wheel being slidden freely along the shaft to the desired position thereon, said method comprising sliding the wheel along the shaft to said desired position thereon, applying to opposite ends of the wheel at a position at the boss or adjacent the outer periphery of the boss, axially directed pressure so as locally to reduce the overall axial thickness of the wheel and cause a displacement of the material in the wheel boss, such as to increase the radial thickness of the boss and decrease the diameter of the boss bore to an extent such as to bring the bore into non-relatively rotatable engagement with the adjacent part of the shaft.

2. A method according to Claim 1, wherein the web at a position adjacent to the periphery of the boss, is formed on each of its faces with opposed oppositely axially extending projections which are subjected to opposed axially directed pressure, applied at positions spaced radially outwardly in relation to the boss, so that the material in the projections subjected to said pressure, is displaced into the boss itself to effect an increase in radial thickness of the boss, and a consequent decrease in the diameter of the boss bore, thereby bringing the boss into gripping non-relatively rotatable engagement with the shaft.

3. A method according to Claim 2, wherein the projections are spaced by a small distance from the adjacent outer periphery of the boss.

4. A method according to Claim 2 or 3, wherein the projections are of such triangular form, for example, equilateral form in cross section, as to taper equally on their radially inner and radially outer faces.

5. A method according to any of Claims 2 to 4, wherein the projections each take the form of an annular rib extending continuously around the web concentric with the centre of the wheel.

6. A method of assembling a wheel on a shaft substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.

7. A method of assembling a wheel on a shaft substantially as hereinbefore described with reference to Figures 4 and 5 of the accompanying drawings.

8. A wheel assembled on a shaft by the method claimed in any one of the preceding claims.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig. 1.

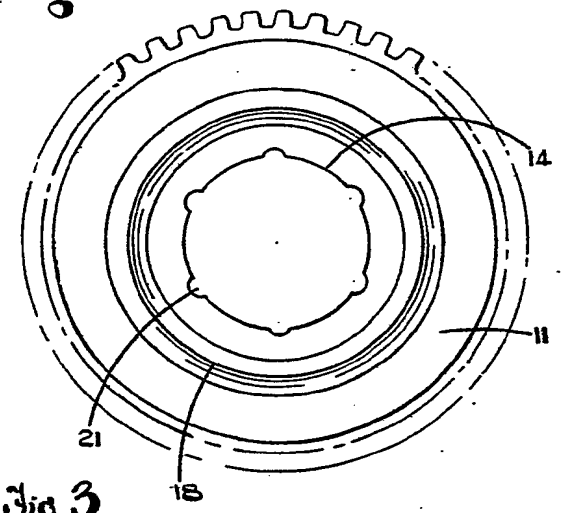

Fig. 2

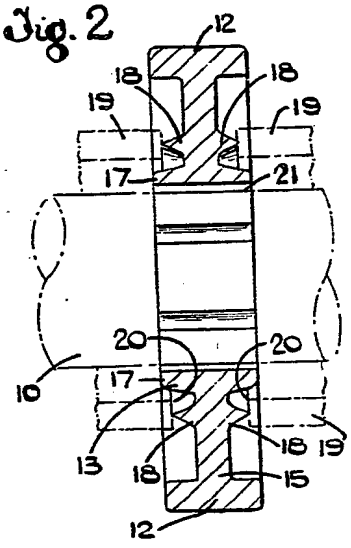

Fig. 3.

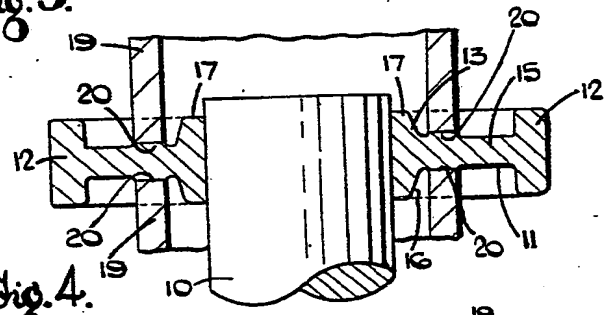

Fig. 4.

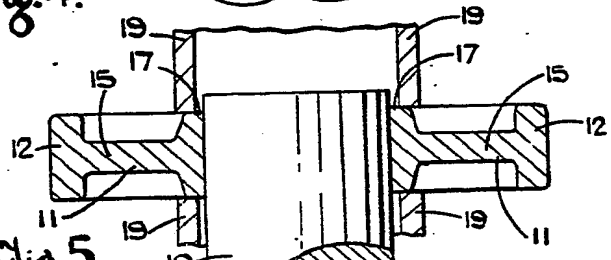

Fig. 5.

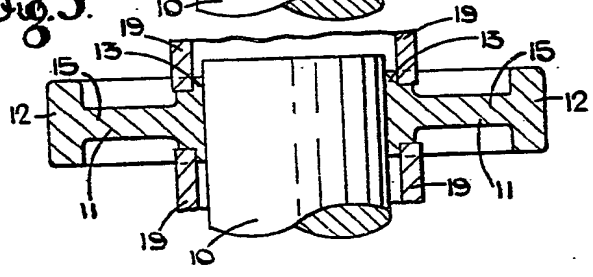

Fig. 6